

# Generator Acid Purification (GAP™)

Reducing Chemical Make-up Costs

Sodium and sulfur are lost from Kraft Mill recovery cycles in air emissions, dregs and grits, washing losses, and spills.

### KRAFT mill chemical make-up

Sulfur losses range from 6 - 8 lb / ton pulp, while sodium losses range from 30 - 40 lb / ton pulp. Replacing these lost chemicals is a significant operating cost.

The sodium sesquisulfate stream from ClO<sub>2</sub> generation is used to replace some of the lost chemicals. Enough sesquisulfate is added to keep the sulfidity at a constant level. The sesquisulfate contains some sodium, but not enough to maintain sodium levels. Replacement sodium has to be added in the form of purchased caustic. Excess sesquisulfate is often sent to sewer.

### The new solution

The GAP™ system has been developed by FPIinnovations to convert sodium sesquisulfate into sodium sulfate and sulfuric acid. GAP™ can be applied to both atmospheric and sub-atmospheric generators.

### Chemical savings

Converting sodium sesquisulfate to sodium sulfate returns 33% more sodium for every pound of sulfate returned to the recovery cycle - reducing the amount of caustic to be purchased.

The sulfuric acid can be used to displace merchant acid for bleach plant acidification, sewer neutralization, or in other areas around the mill. Some or all of the acid may be recirculated to the generator if this is preferred.

### The acid purification unit

The GAP™ system utilizes Eco-Tec's patented Acid Purification Unit (APU™) to achieve selective removal of sulfuric acid from sodium sesquisulfate. First applied to metal-pickling



waste acids, the rugged and reliable APU has benefited from experience gained in hundreds of applications. **No chemicals are required for resin bed regeneration** - only water.

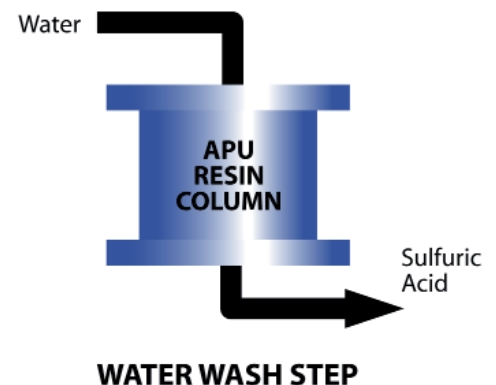
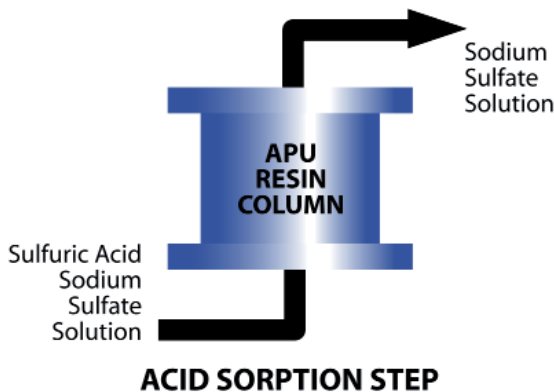
### No additional reboiler load

If the acid is not recirculated, the GAP™ system imposes no additional evaporation load on the ClO<sub>2</sub> generator. Competing systems require up to 1 ton of steam per ton of ClO<sub>2</sub> produced to recirculate sodium bisulfate - reducing the project savings.

### No shutdown required

The GAP™ system requires no shut down for installation. It runs independently of the generator and will not affect a mill's ClO<sub>2</sub> supply.

pulp & paper group



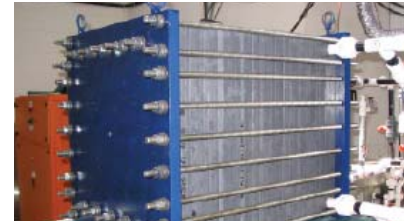
# technology and engineering solutions for the process and resource industries



Nitration



Sulfuric Acid



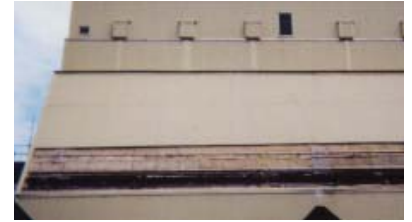
Electrochemical



Biosystems



Pulp&Paper



Environmental

## Company Profile

NORAM is a private engineering and technology firm based in Vancouver BC, Canada. We specialize in the development, engineering and commercialization of new chemical processes, and in the improvement and optimization of existing technologies. Since 1988 NORAM has provided leading-edge technologies to the chemical, pulp and paper, minerals processing, wastewater and electrochemical industries.

Today NORAM is the world's leading supplier of nitration technology. In addition, we offer sulfuric acid plants, biological treatment facilities, energy systems, and technologies for the clean-tech sectors.

Our business has developed around the supply of proprietary engineering and equipment packages to our clients.

Core competencies include:

- Nitration and NO<sub>x</sub> Technology
- Electrochemical Systems
- Sulfuric Acid Manufacture
- Biological Wastewater Treatment
- Computational Fluid Dynamics & Finite Element Analysis
- Heat Transfer & Heat Exchangers
- Hydrogen, Sulfur and Chlorine Chemistry
- Fluidised Bed Systems
- Energy Storage
- System Closure

## Partnering with Innovation and Experience

NORAM works extensively with early-stage technology companies. We draw on established competencies in process design and engineering, provide custom in-house fabrication capabilities, and offer pilot plant and contract research facilities to support the commercialization process.

We've teamed up with organizations around the globe to allow project execution on 5 continents. Our strategic relationships include:

- Bateman Engineering BV
- Canadian Hydrogen and Fuel Cell Association
- ECO-TEC Inc.
- First Chemical Corporation (a DuPont Company)
- FP Innovations
- Kemetco Research Inc.
- Membrane Reactor Technologies
- Ostara Nutrient Recovery Technologies Inc.
- Radiant Technologies Inc.
- Siloxy Limited
- Simon Carves Ltd (Punj Lloyd Group)
- Electrosynthesis Company Inc.

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